ARC TRAINING CENTRE FOR
GREEN CHEMISTRY
IN MANUFACTURING

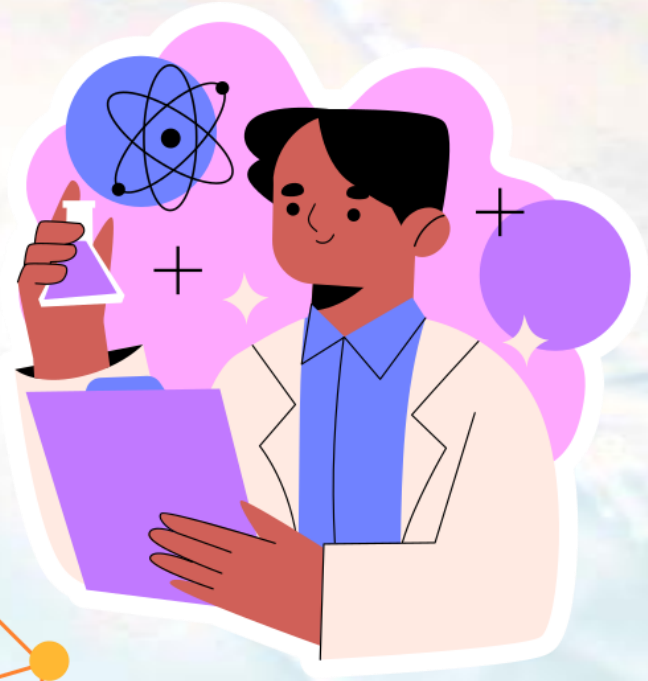
The Outreach Program is proudly sponsored by

DKSH

Biodegradable Water Bottles from Brown Seaweed

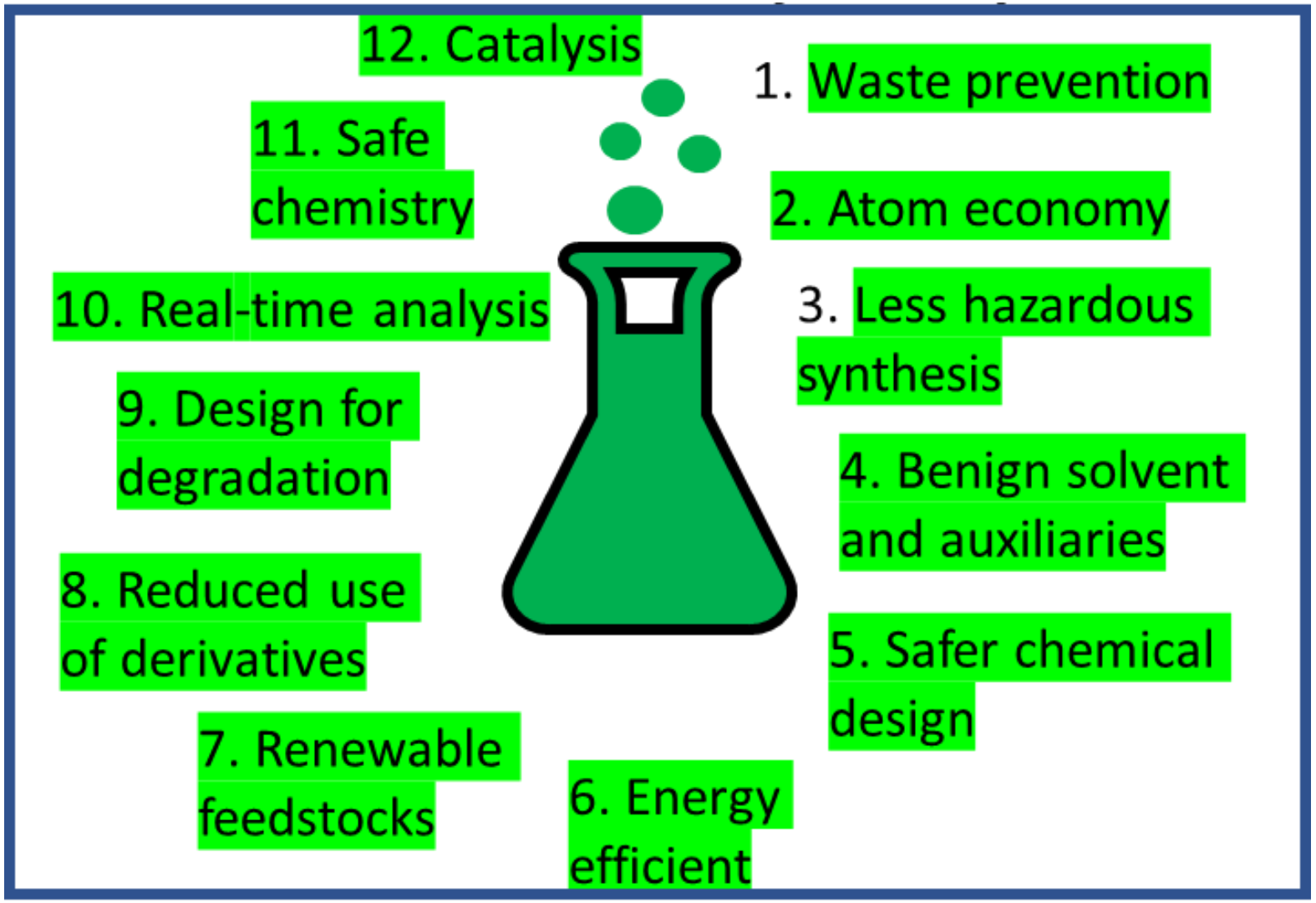
Learning intentions

1. Introduce you to green chemistry
2. Understand how we can use a sustainable resource (seaweed) to reduce plastic pollution
3. Ideas on creating a safer future through next generation… ALL OF YOU!



Who has heard about Green Chemistry before?

Green Chemistry principles



After your experiment, we want you to think about:

What principles you might have achieved today?


SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
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Setting the scene

We have a problem: Plastics are everywhere in the environment


88 % of the sea surface is polluted
with plastic waste


They can take 20-500 years
to break down…


They can take 20-500 years
to break down…
and they don’t completely go away


Instead you get a plastic
‘soup’

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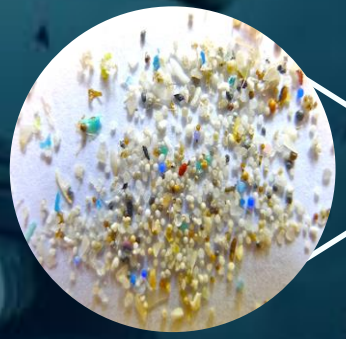
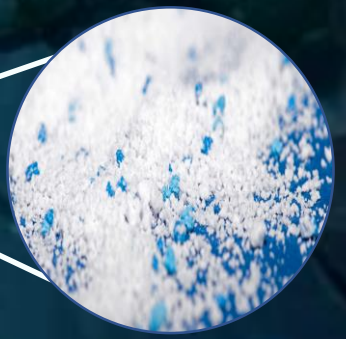
Macroplastics
> 1 cm



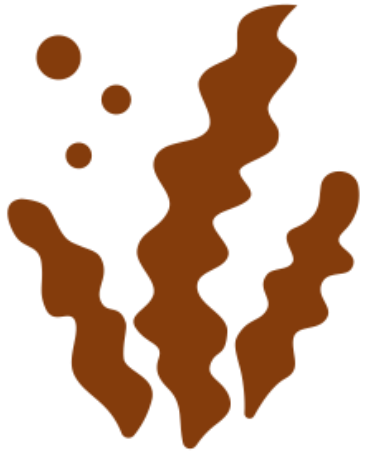
Mesoplastics
1–10 mm



Microplastics
< 1 mm

So… What can we do about it?

- **https://edition.cnn.com/videos/world/2021/10/27/seaweed-packaging-notpla-c2e-spc-intl.cnn**



Let’s make some sustainable plastic!

Ground rules

=

1. No eating your experiment!
2. No running in the lab.
3. Use gloves.
4. Allergies to seaweed, please do not touch.
5. Do not throw objects/liquids.
6. If there is a spill, please let us know. There is paper towel on your table.
7. Be careful not to get food dye on your clothes.

Making small seaweed water bottles!

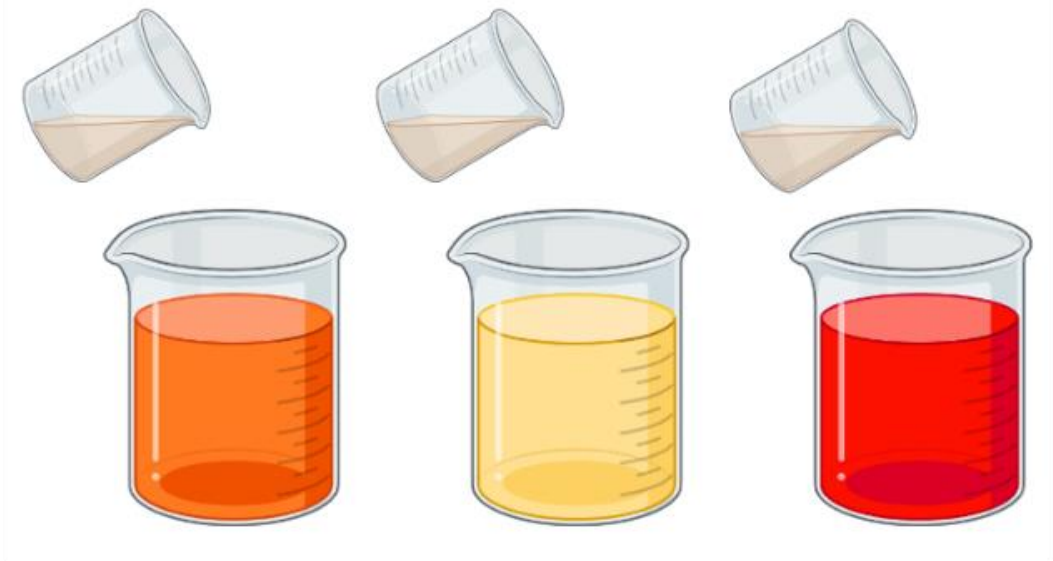
STEP 1:
Collect your liquids.

Orange juice

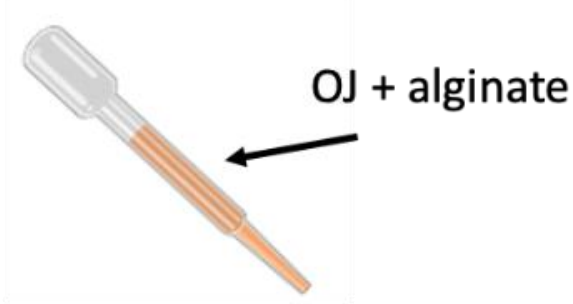
Milk

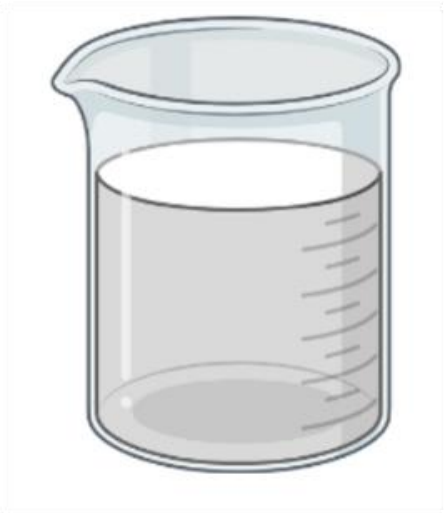
Water + food colouring (few drops)

STEP 2:
Mix 10ml of alginate with 10ml of your liquid. Stir to combine.
Test the pH of your solutions.



STEP 3:
Pipette drop your alginate liquids into the calcium chloride.
Observe what happens ☺





Calcium chloride

Pit-stop: How are you going?

Begin to have a go answering questions

5 minute warning!

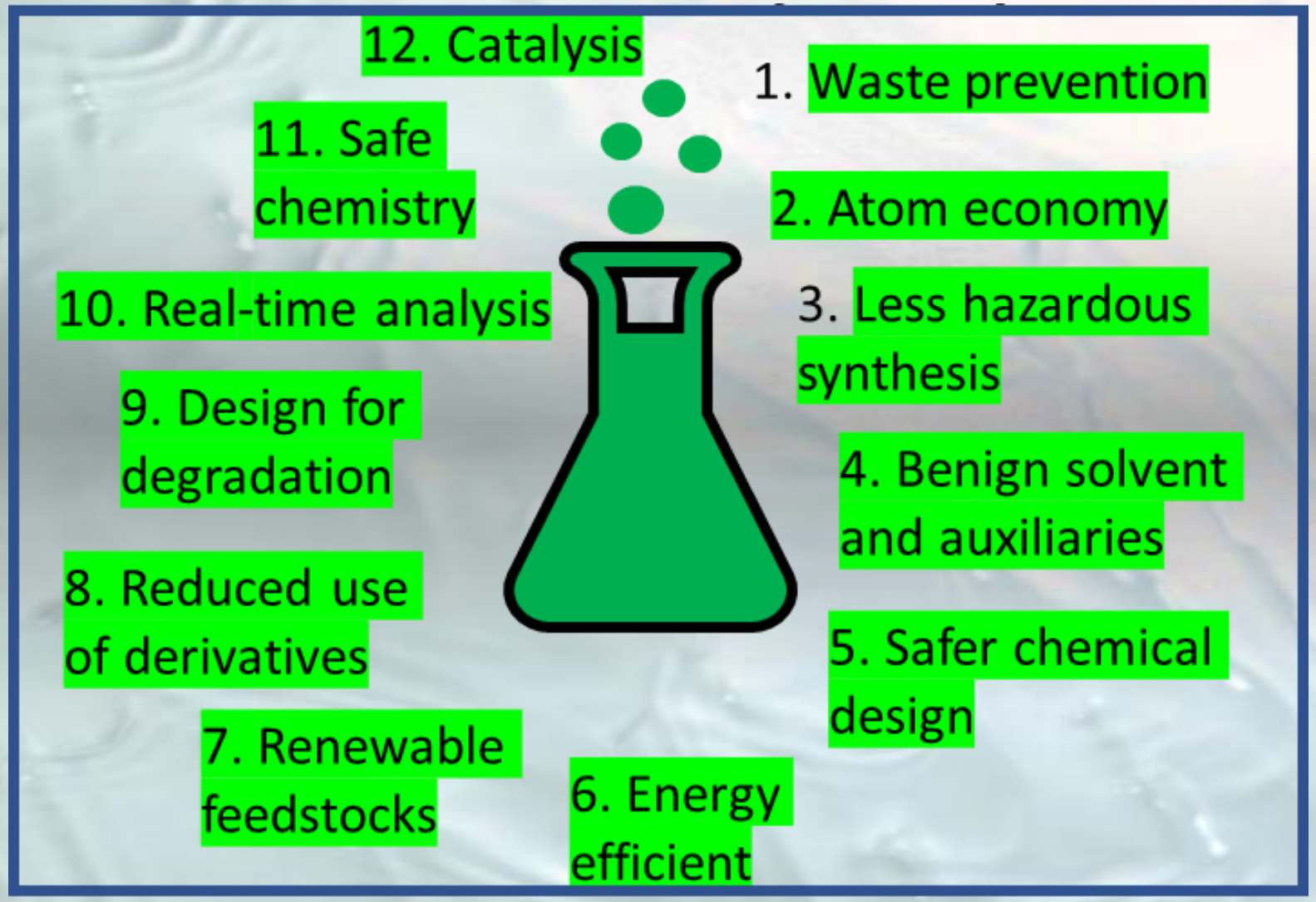
Pack up, clean materials and be seated for discussion

What did you observe?

What happened? Can this be used for a water bottle? Why/why not?

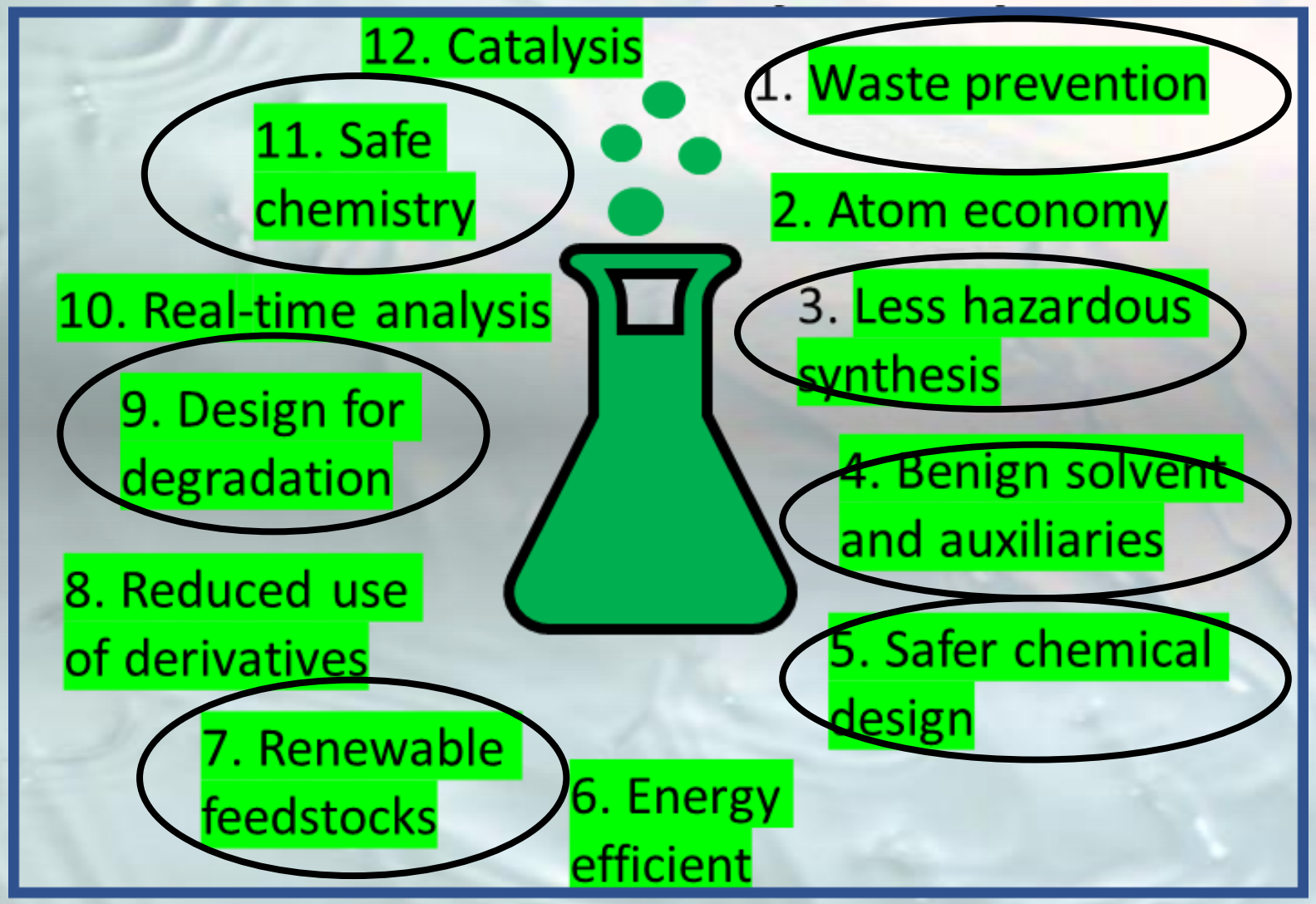
How could you improve this experiment?

Green Chemistry principles



What principles do you think you observed today?

Green Chemistry principles



What principles do you think you observed today?

Extension questions

What was the solvent and what was the solute?

How else could you use the properties of alginate to help the environment?

Was this a chemical reaction? Why/why not?

References

- Atsuhiko Isobe, et.al. A multilevel dataset of microplastic abundance in the world's upper ocean and the Laurentian Great Lakes. *Microplastics and Nanoplastics*, (2021)
- Chamas, A. *et al.* Degradation Rates of Plastics in the Environment. *ACS Sustainable Chem. Eng.* **8**, 3494–3511 (2020)
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